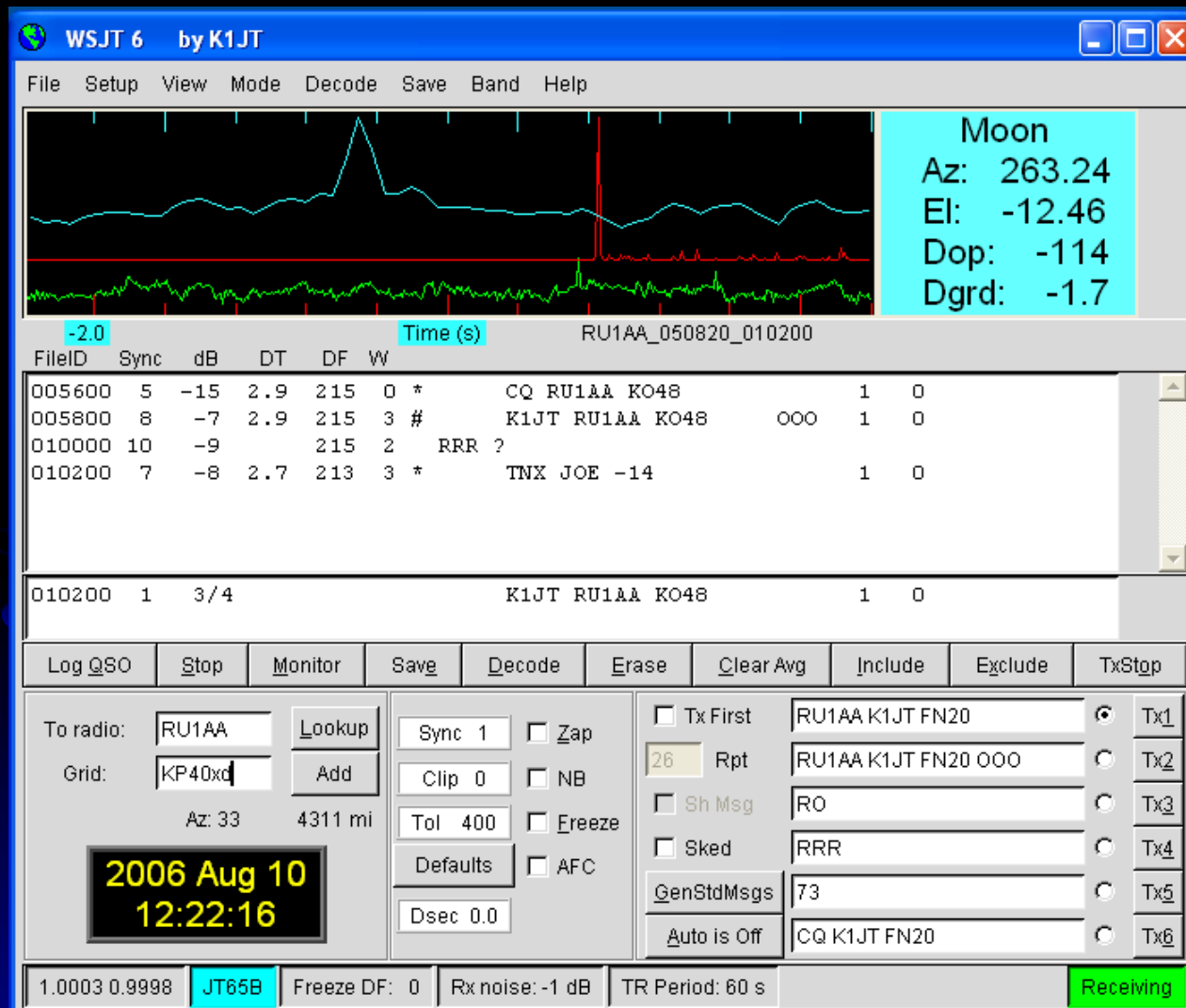


JT65 on 6 Meters



SMOGfest
2006

Joe Taylor
K1JT

WSJT History

2001: FSK441 for meteor scatter

2002: JT44 for EME

2002: JT6M for MS, ionoscatter on 6 m

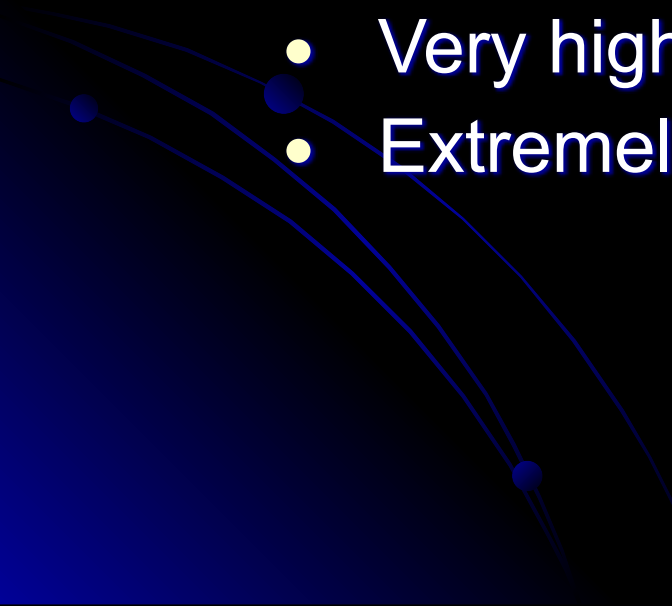
2003: JT65 for EME, with FEC

2004: JT65B, JT65C

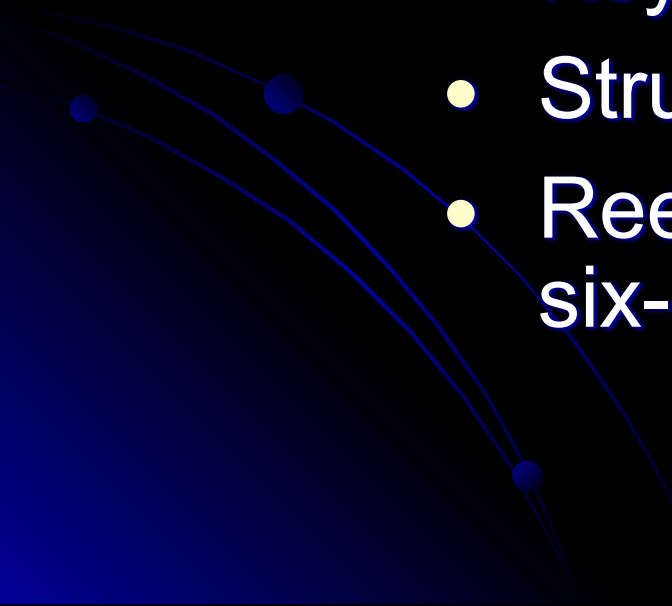
2005: JT65 “Deep Search” decoder;
Open Source code release

2006: Linux and FreeBSD versions;
many algorithmic improvements;
programming team formed

Design Goals for JT65

- Work at lowest possible signal levels
 - Conform to standard operating practices
 - Exchange all info required for valid QSOs
 - Good QSO rate for contests, DXpeditions
 - Very high confidence in copied information
 - Extremely low probability of false QSOs
- 

JT65 Specs

- Sync tone at 1270.5 Hz, pseudo-random keying sequence
 - Data tones up to 1448 Hz (A)
 - Keying rate 2.7 baud
 - Structured, compressed messages
 - Reed-Solomon (63,12) code with six-bit symbols
- 

WSJT Statistics: September 2006

- Total users: >3000
- Nearly all amateur MS uses FSK441
- JT6M popular on 6m
- JT65 EME users: 300 – 600
- JT65 EME QSOs: >40,000
- 30% of entries in 2005 ARRL EME contest used JT65 (on 2m, >70%)

JT65 EME, Band-by-Band

6 m: QSOs made almost daily

2 m: 1-yagi to 2-yagi QSOs common

70 cm: usage slowly increasing ?

23 cm: usage increasing

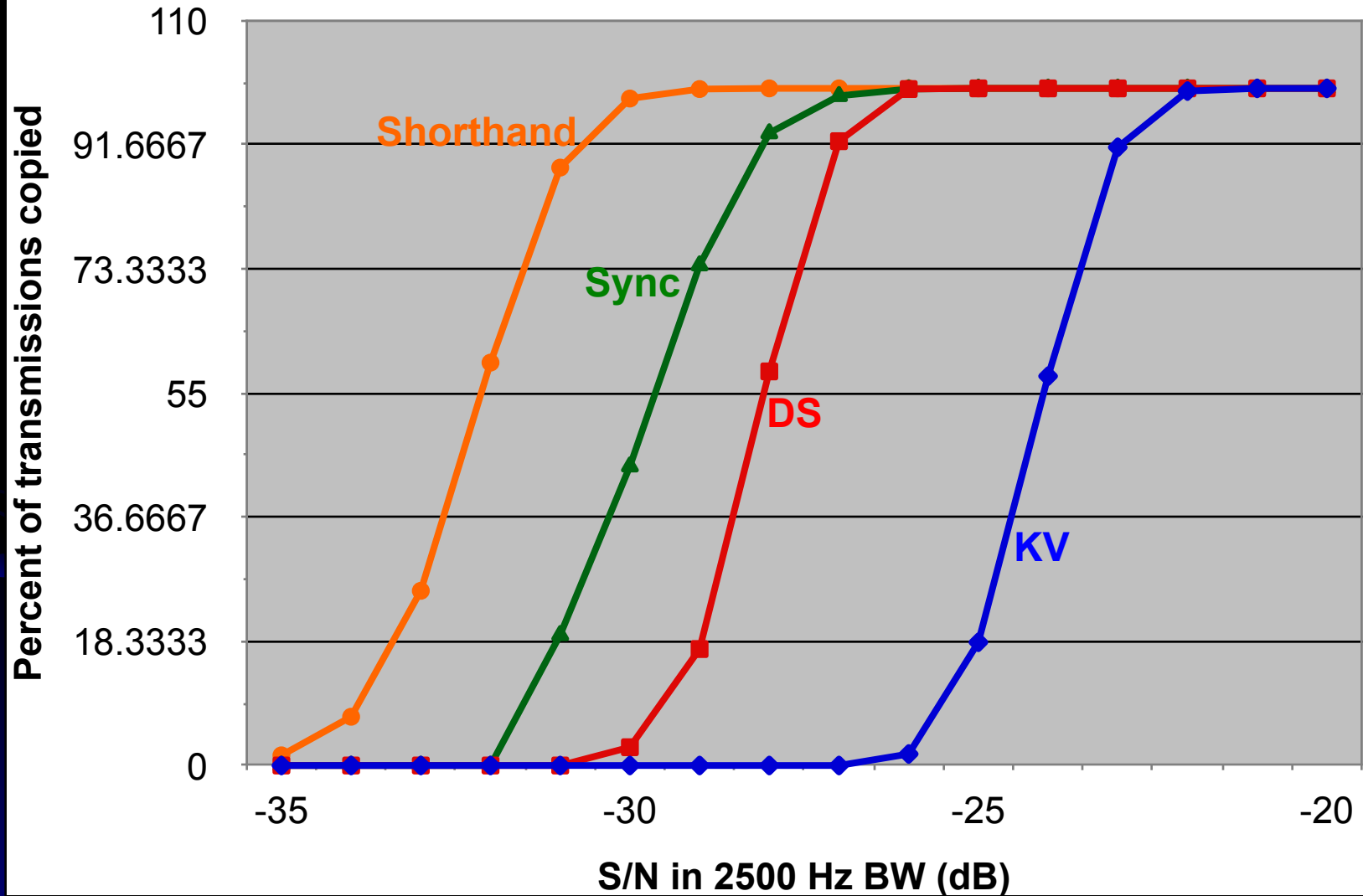
↖ With 2.3–3m TVRO dishes, 5 Watts is enough!



JT65: Differences from CW

- Structured messages
- Error-correcting code
- Synchronized transmissions
- Transmissions can be averaged
- Copy is “all or nothing”
- Roughly 10 dB advantage

Measured JT65 Performance



Minimal JT65 QSO

1. CQ HB9Q JN47

2. HB9Q K1JT FN20

3. K1JT HB9Q JN47 OOO

4. RO

5. RRR

6. 73

Pileup Situations

1. CQ 3Y0X EC41

2. 3Y0X K2TXB FM29

3. K2TXB 3Y0X EC41 OOO

4. 3Y0X K2TXB RO

5. K2TXB 3Y0X RRR

6.

73



Callsign-tagged reports, RRRs

JT65 Decoding Thresholds

| Message type | KV (dB) | KV Avg (dB) | DS (dB) | Short65 (dB) |
|---------------|------------|----------------|------------|-----------------|
| Arbitrary | −24 | −28 | | |
| BC + Grid/Rpt | −24 | −28 | −28* | |
| Shorthand | | | | −32 |

Sync limit: −30 dB

*Callsign must be in list

Some EME Politics

On a web site: "... only two characters need to be decoded to print full EME messages..."

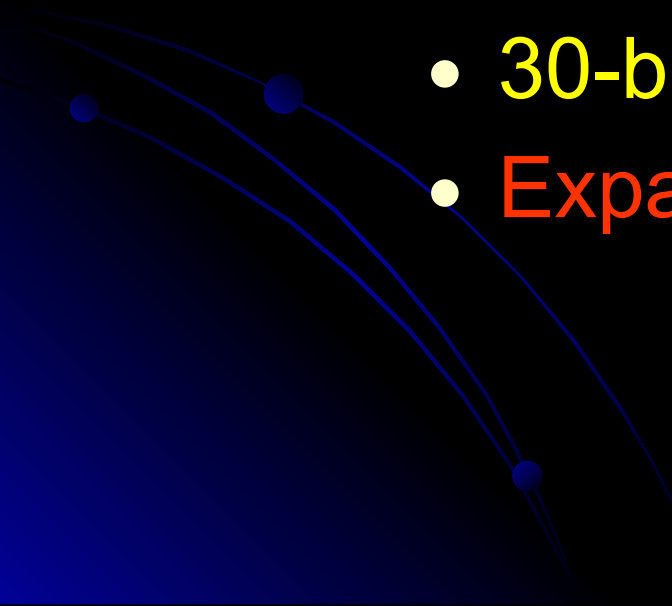
Editorial in a respected VHF/UHF journal: "... the JT65 mode when using the Deep Search Decoder ... needs to 'recognize' just only 2 letters but displays a full callsign."

Another web site: "All JT65 QSOs made using the Deep-Search Routine are not complying with long established EME QSO guidelines and are not eligible [for this Top List] due to partial copy."

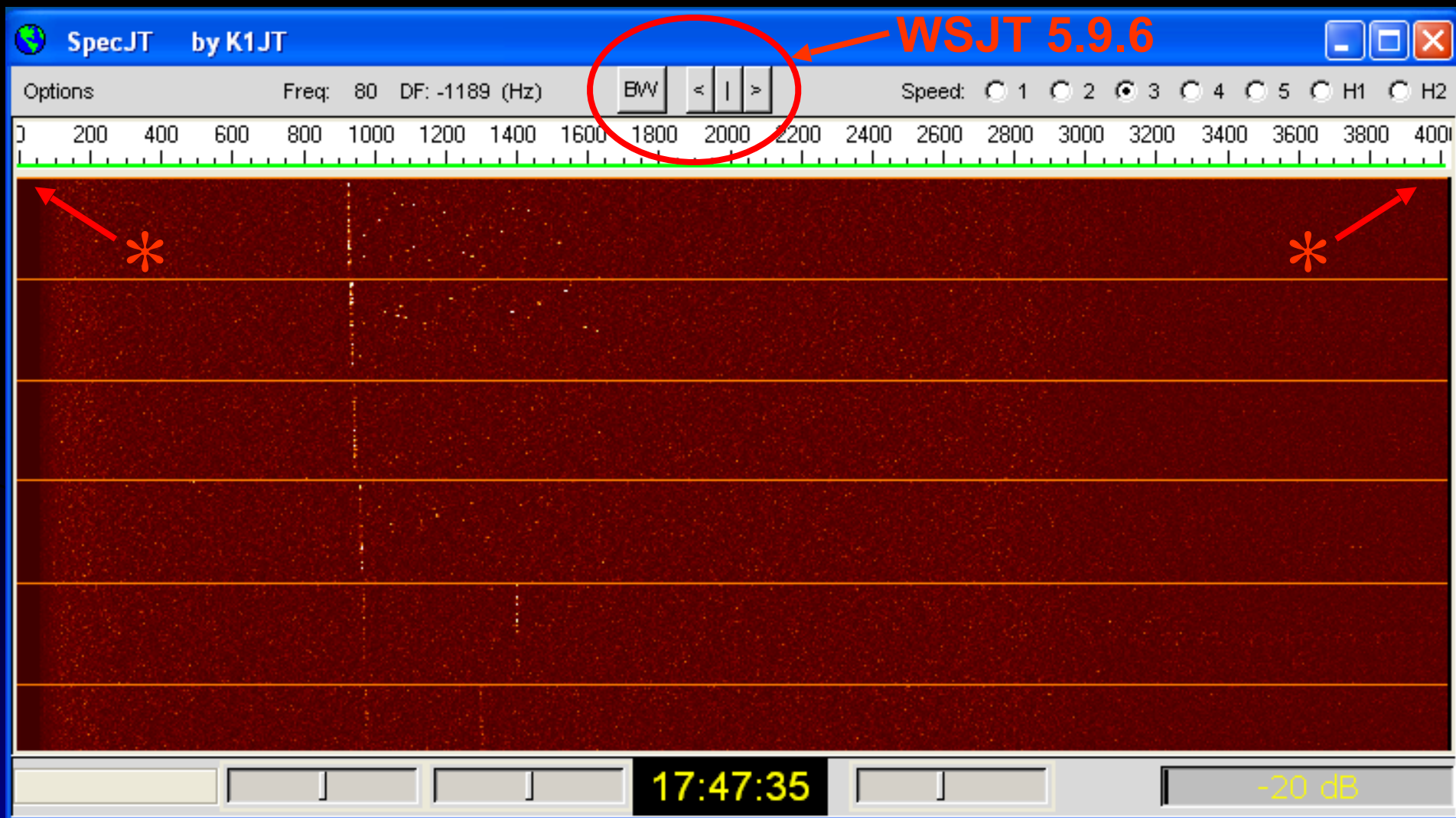
*** WRONG ***

See paper "How Many Bits Are Copied in a JT65 Transmission?" published in DUBUS, 3/2006

Future WSJT plans?

- Enhanced meteor scatter mode ?
 - Connection to Linrad / Winrad ?
 - New soft-decision RS decoder
 - EME Echo and Measure modes
 - 30-bit JT65 messages
 - Expanded waterfall: 0 – 5 kHz
- 

Expanded waterfall bandwidth



30-bit Messages

| | <u>Bits</u> |
|-------------------|-------------|
| 1. CQ de 3Y0X | 30 |
| 2. de K2TXB | 30 |
| 3. K2TXB 3Y0X OOO | 72 |
| 4. 3Y0X K2TXB RO | 72 |
| 5. TXB de 0X RRR | 30 |
| 6. 73 de K2TXB | 30 |

Notes:

- No grid locators
- Reports and Rs tagged with callsigns
- Numerical reports optional
- Messages 5 and 6 can be shorthands
- No need for a callsign list

JT65+ Decoding Thresholds

| Message type | KV (dB) | KV Avg (dB) | DS (dB) | Short65 (dB) |
|---------------|------------|----------------|------------|-----------------|
| Arbitrary | -24 | -28 | | |
| BC + Grid/Rpt | -24 | -28 | -28* | |
| Shorthand | | | | -32 |
| 30-bit | -27 | | | |

*No callsign list required

Programmer's Information

- GNU General Public License (GPL)
- Languages:
 - **Python** for user interface
 - **Fortran** for number crunching
 - **C** for A/D, D/A, PTT, ...
- Compile on Windows, Linux, ...
- **New contributors welcome !**
<http://developer.berlios.de/projects/wsjt>
wsjt-devel@lists.berlios.de
- Details on web site

to the demos

...

